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Fixed vertically mobile continents: The birth and growth in deep pits on the planet's surface

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ABSTRACT

It is shown that the main fundamental feature of the Earth's continents - the emergence them in a huge deep pits on the planet's surface and the formation them in these fixed places throughout all geological history, for 4.4 billion years. The thickness of the earth's crust has consistently increased due to sedimentation and magmatism in the descending and ascending tectonic movements. As a result, the huge growths of the specific basalt – sialic crust, called continents, have been created. Method of research is the synthesis of geological data obtained in the last 150 years. The result of the study is a proof of immobility continents, formed in certain places of the planet's peridotite surface.

Keywords: initial Earth, deep pits on surface, basalt - sial growth, immobile continents

1. INTRODUCTION

Geological structures of the Earth's continents and oceans bottom was established during the nineteenth and twentieth centuries. According to the model of the Earth, developed in 1873 by the American geologist J. Dan, the initially Earth, on a hot stage was divided into areas with granite earth's crust and areas with heavy basaltic crust (Hallam, 1985).

The great Austrian geologist E. Sues emphasized that the sectors with heavy basaltic crust collapsed, plunged and appeared oceans it is due to a general compression of the Earth. Continental rocks rich in silica and aluminum, he called SIAL and heavy basalt rocks lower of them and in the oceans, with a high content of iron and magnesium, were named Sima (Hallam, 1985).

These views were confirmed in the middle of the twentieth century to the more extensive geological and geophysical data of the great German geologist H. Stille, in 1908-1958 (Stille, 1964) and contributions of other researchers (Magnitsky, 1953; King, 1961).

Extensive geological and geophysical studies in the bottom of the oceans in the second half of the twentieth century, with the underwater drilling of wells' hundreds confirmed the known data about the different types of the crust. However, new and interesting data were obtained. It turned out that the primary oceanic crust of gabbro-peridotite composition is covered by young sediments and basalt of Mesozoic and Cenozoic age. Ocean waters, covering them also emerged recently, simultaneously with the forming huge grabens and younger sediments.

In addition, it was found that the edges of the continents were also flooded by the ocean waters (Belousov, 1962; Orlenok, 2010). And what is most interesting that the bottom of the Arctic Ocean is a lowered part of American-Eurasian continent, the western part of which (between Greenland and Europe) is lowered recently - in the Neogene time (Belousov, 1962; Orlenok, 2010; Pushcharovsky, 2012).

New, more detailed studies of these structures in twenty-first century confirmed submissions of the above classics of World Geology about the Earth's continents autonomous structure and specific development (Shlezinger, 2003; Blyuman, 1998, 2011; Kuprin, 2010; Zhirnov, 2012, 2014a, 2014b).

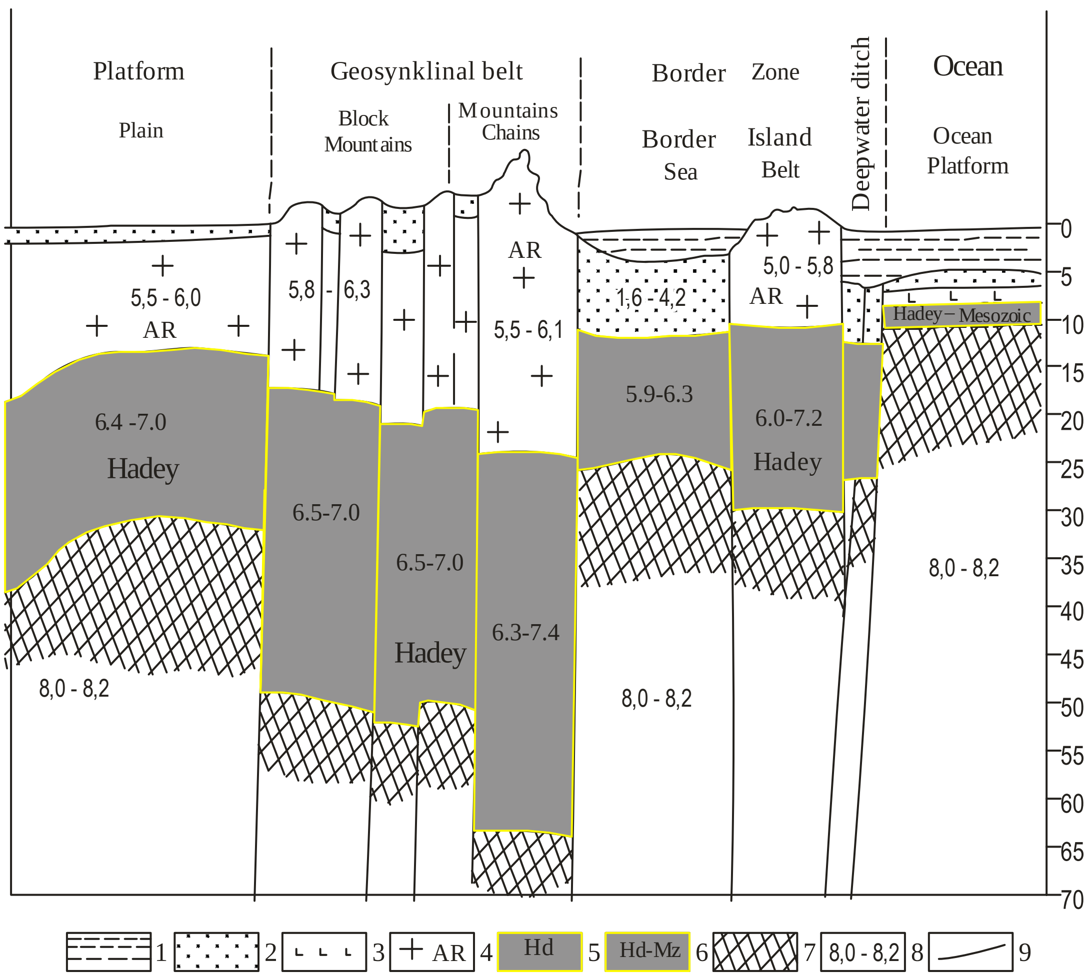

Figure 1

Geological and geophysical section of the Asia continent's crust and the Pacific Ocean crust (Khain, 1964; Zhirnov, 2014b). 1 - sea water; 2 – sediment layer; 3 - basalt layer; 4 - granite-gneiss layer; 5 - granulite-basic (metabazalt) layer; 6 - peridotite (gabbro-serpentinite) layer; initial crust of the upper mantle; 7 - the upper mantle; 8 - velocity of longitudinal seismic waves; 9 - deep faults.

Large generalizations on this matter of the XX century are confirmed with modern data, including with application of isotope and geochemical data (Demenitskaya, 1975; Salop, 1982; Blyuman, 1998; 2011).

2. MATERIALS AND METHODOLOGY

Materials for solving the problem are the results of World classical geology in XIX - XX centuries, especially extensive geological and geophysical investigations of the second half of the twentieth century and at the beginning of a new twenty-first century, as reflected in a number of generalizations of contemporary researchers. It is also used the authors' papers on the Asia's lineament tectonics and the continents' development as markers of the Earths' core geodynamics and planet's evolution (Zhirnov, 2008, 2011a, 2011b, 2014a, 2014b).

3. RESULTS

3.1. Geological structure of continents and oceans floor

Two types of planetary geological structures - continental and oceanic are defined in a structure of Earth's crust. All continents are characterized specific, continental, type of the crust's a structure and composition. All oceans are distinguished by their different bottom crust, ultramafic (sima) or, so-called, "oceanic" type (figure 1).

Continents: Now northern continents are grouped into two big continents – American and Euro-Asian with two southern ends – African and Australian. In the polar region they are divided by the Arctic Ocean. However 400 million years ago the Arctic water basin wasn't and both continents made up the uniform land (Demenitskaya, 1975; Kashubin et al., 2011; Zhirnov, 2014b). In such way, all continents of the northern hemisphere of Earth represented the earlier uniform Continent - the uniform megacontinent (Zhirnov, 2014b). It was continuous in the North and dismembered in the south, with sharply narrowed ends of certain continents – Southern American, African and Asian that predetermined its specific three-beam form – as in the form of "carrot" with several roots (figure 2).

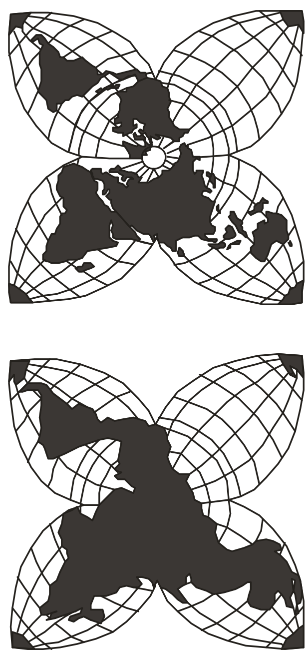

Figure 2

Northern megacontinent of the Earth: top is a modern situation, its edges are flooded with waters of the World Ocean; bottom is an initial situation, in early Paleozoic time (Zhirnov, 2014a, 2014b).

Three main layers are established in a structure of continents' earth crust (from below to up): "basalt" (granulite-basic or metabasalt) layer, granite-gneissic layer and sedimentary layer. The basalt layer has a big power, on the average 10-20 km, and difficult petrographical composition. Primary basalts in it intensely metamorphosed and presented by any crystal slates and gneisses, in combination with metamorphic gabbro, peridotites and eklogite-like rocks (Belousov, 1975; Blyuman, 1998; Rezanov, 2006).

The granite-gneissic layer of also big power, up to 10-25 km, formed on a metabasalt layer due to transformation of initially sedimentary rocks to palingenic granites and intruded of a large number of intrusive batholites. The granite-gneissic layer is covered above by the sedimentary layer presented by the horizontal and folded sedimentary rocks (thickness of 0-5 km, and 10-25 km sometimes) more younger age – from Proterozoic to Phanerozoic age (figure 1).

Thus, earthly crust of continents is characterized by very big power: down - specific metabasalt layer, on it - granite-gneissic" (sial) layer (with high content of silicon dioxide and aluminium) and even higher - a thick sedimentary layer, often collected in folded forms.

'Oceanic' crust: 'Oceanic' crust is characterized essentially by other geological structure. It also has a three-layer structure, but chemical and petrographical composition of these layers absolutely others (figure 3). The lower layer of oceanic crust has peridotite composition. Peridotites are found in the walls of deep grabens in axial part of median and oceanic ridges (Belousov, 1975; Shulyatin et al., 2012). They are often transformed in serpentine and crossed by a large number of vertical dykes and gabbros' stocks. The thickness of this layer is 5 km; actually it is the top layer of a peridotite mantle which consolidated more than 4 billion years ago. Later in the Mesozoic time it was crossed by dykes and stocks of gabbros.

The second layer of the oceanic crust thickness of 1-2 km is represented by young basalts (MZ-CZ age). The basalt layer often alternates with horizontal layers of sedimentary rocks. The third layer of oceanic crust is put by low-power, mainly friable rocks (clays, sand, limestones, aleurolites), the thickness of a few hundred meters, on the borders of the continents up to 1-10 km. Their age ranges from the Late Jurassic (150-135 million years ago) to the Quaternary ago (1-2 million years ago) (Kosygin, 1988; Orlenok, 2010).

Earthly crust of continents and oceans sharply differs on geochemical features. Continental crust is enriched with oxygen, aluminium, silicon, barium, and also alkaline, radioactive and rare-earth elements (Belousov, 1975; Blyuman, 1998; Rezanov, 2006). Respectively, the top mantle under it, to a depth of 400 - 600 km, is significantly depleted by the above incoherent elements, due to extraction by endogenous fluids and carrying out in overlying continental crust.

'Oceanic' crust, composed of primitive tholeiitic basalts, opposite depleted specified elements, especially potassium, and the mantle under it, is poorly differentiated and according to the content of incoherent elements is close to meteorites from space (Magnitsky, 1953; Voytkevich, 1988).

3.2. Geological history of the continental and oceanic crust

Geological history of the development of various planetary structures is radically different. Both types of structures arose initially in at one time – in the Hadean, about 4,4 billion years ago, after the planet's transition from the state of the planet's hot shining body in the state of the hot body with a temperature on a surface near 700-1000^{o} C (Muratov, 1975; Rezanov, 2006).

'Oceanic' crust: The planet surface occupied with modern "oceanic" crust in the Hadean quietly crystallized and turned into a primary crust of peridotite and, partially, anortozite composition. Then for 4 billion years before Mesozoic this primary crust remained unchanged (Muratov, 1975; Shlezinger, 2003). Only in the Mesozoic - Cenozoic time it was covered from above with a cover of basalts and a low-power layer of friable rocks.

Thus, to the Mesozoic time this primary ultrabasic crust was the land and was in a passive position, representing a quiet basic surrounding area with roughly formed continents. The actual geological development of 'oceanic' crust began only in the Mesozoic - Cenozoic time.

At this time, 170 - 10 million years ago, the large stage of a diastrophism was took place in geological history of the Earth. Huge territories of primary ultrabasic crust were deep lowered on suburbs of continents. Simultaneously the large mass of basalts outpourings along numerous breaks and filling of the arisen hollows with synchronously formed oceanic water. Besides the world system of median oceanic ridges was formed. Borders parts of many continents were flooded at the same time, and the continental territory between modern North American and Euro-Asian lands was lowered and flooded completely and turned into the Arctic Ocean (Demenitskay, 1975; Orlenok, 2010; Zhirnov, 2014b).

Continental crust differs essentially in other algorithm of geological development. Initial tectonic setting of the top mantle under the modern continents' sole was distinctive feature of territories under the pre-continents. In figures 3 and 4 it is clearly visible that continents started being formed in deep hollows (pits) on a surface of the top mantle.

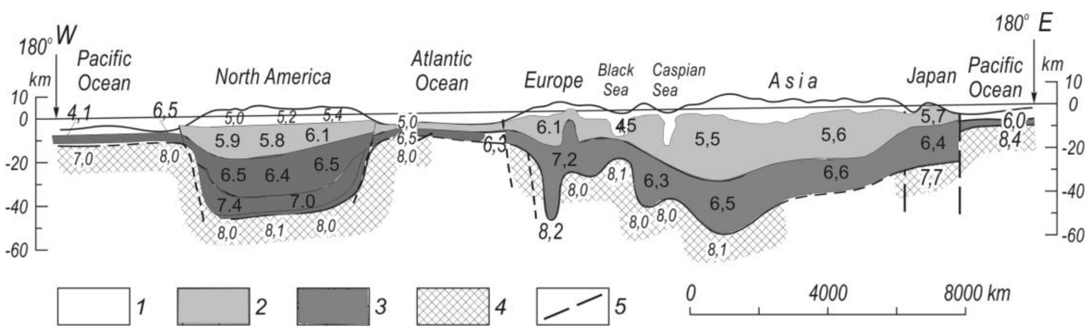

Figure 3

Geologic-geophysical section of the Northern hemisphere's earthly crust (latitude 45^{o}). On G. Kloos and K. Benke (Khain, 1964). East region of Asia is specified by data (Van der Hilst et al; 1992; Zhirnov, 2014a). 1 – Precipitation and 'granite'; 2 – 'upper basalt'; 3 – 'down basalt'; 4 – peridotite mantle. Figures – velocity of longitudinal seismic waves.

The first deep pits on the planet which arose in Hadean were filled with huge volumes of more hotly basalt magma melted from an ultrabasic mantle in rather oxidized situation 4.4 billion years ago. These basalts quickly underwent a metamorphism (Kbar pressure-10, temperature 700 - 1000° C) and turned into a powerful granulite-basalt (metabasalt) layer – the lower layer of continents (Muratov, 1975; Salop, 1982; Rezanov, 2006).

The first deep oval deflections – basins (15-25 km) with sea water appeared in the Archean and began formation the thickness layers of sedimentary rocks (examples: Pilbara - in Australia, Greenland - in North America, Aldan in Eastern Siberia). Then the most powerful granitoid magmatism and a metamorphism, was shown here repeatedly under the influence of gas hydrogen-silicon endogenous fluids.

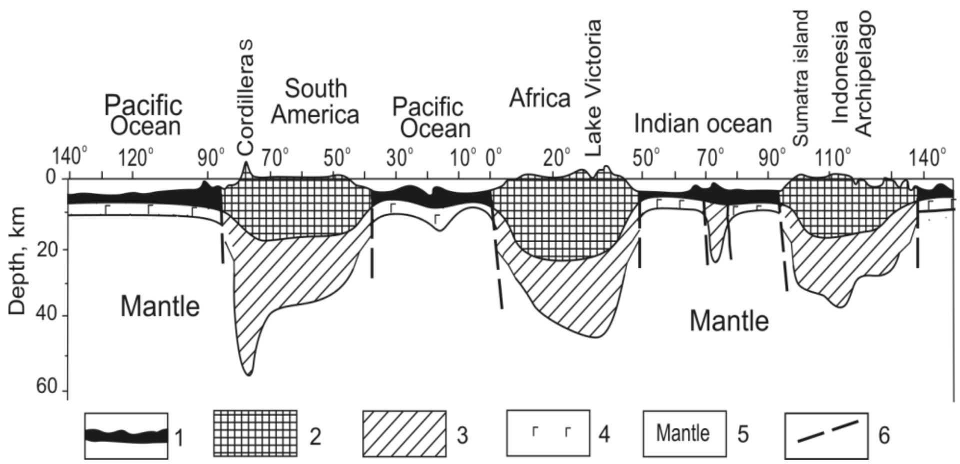

Figure 4
Geological - geophysical section of earthly crust along the Earth's equator (Demenitskya, 1975), with the addition of faults in (Belousov, 1975, 1989; Zhirnov, 2014b). 1 – Basalt and sedimentary layer (MZ-KZ); 2 – sial (sedimentary and granite-gneissic) layer; 3 – sima (metabasalt) layer; 4 –initial peridotite crust, crossed by dykes gabbros; 5 – top mantle; 6 – vertical and inclined breaks at the edges of continents

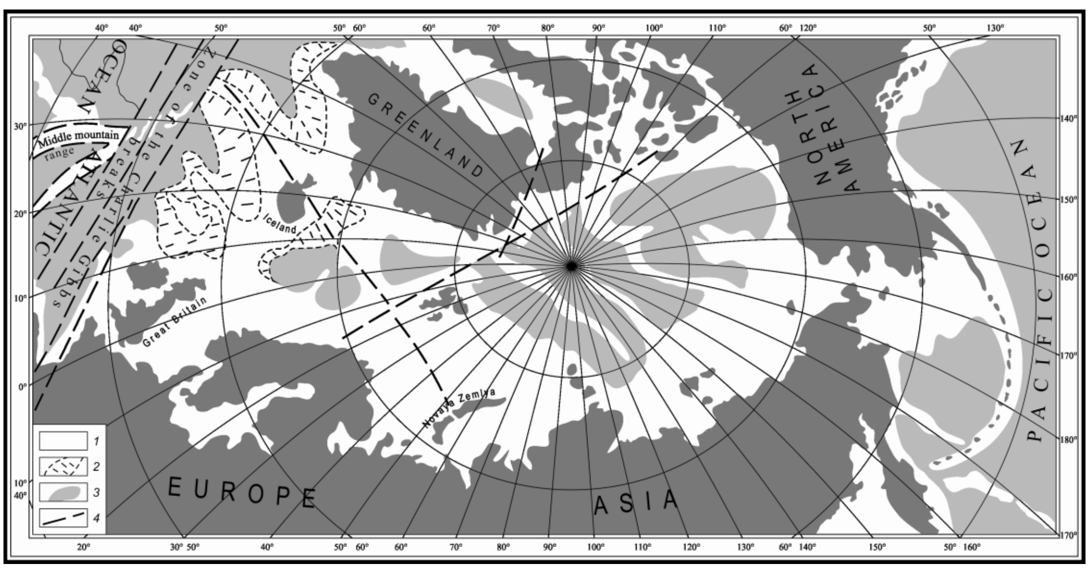

Figure 5
Huge continental shelf covers almost the entire territory of the Arctic Ocean (Atlas…, 1980; Zhirnov, 2014a). 1 – Continental shelf; 2 – continental slopes; 3 – deepwater hollows; 4 – faults.

As a result, sedimentary rocks and, partially, metabasalts were turned into rocks of tonalit - trondyemit-granodiorite composition ("gray gneisses") – the sial layer of the consolidated base of continents was created. The period of formation of the crust’s sial layer– the longest in geological development of Earth, from 4.0 to 1.8 billion years ago, i.e. it included all Archean and lower Proterozoic (Khain, 1964; Stille, 1964; Belousov, 1975; Salop, 1982; Rezanov, 2006).

Ancient rocks are characterized by a number of features that are unique to only in the Archean-Hadean: 1) the huge scale of their manifestation – they are developed in foundation of all modern continents; 2) the strongest metamorphism of rocks in the conditions of granulite facies; 3) domination of plastic deformations of rocks; in connection with high temperatures of a surface of the cooling-down crust, from 1000° to 100-70° C; 4) mass and universal formation of the circular and oval forms, both for sedimentary rocks, and for magmatic bodies of the basic and sour composition (Salop, 1982).

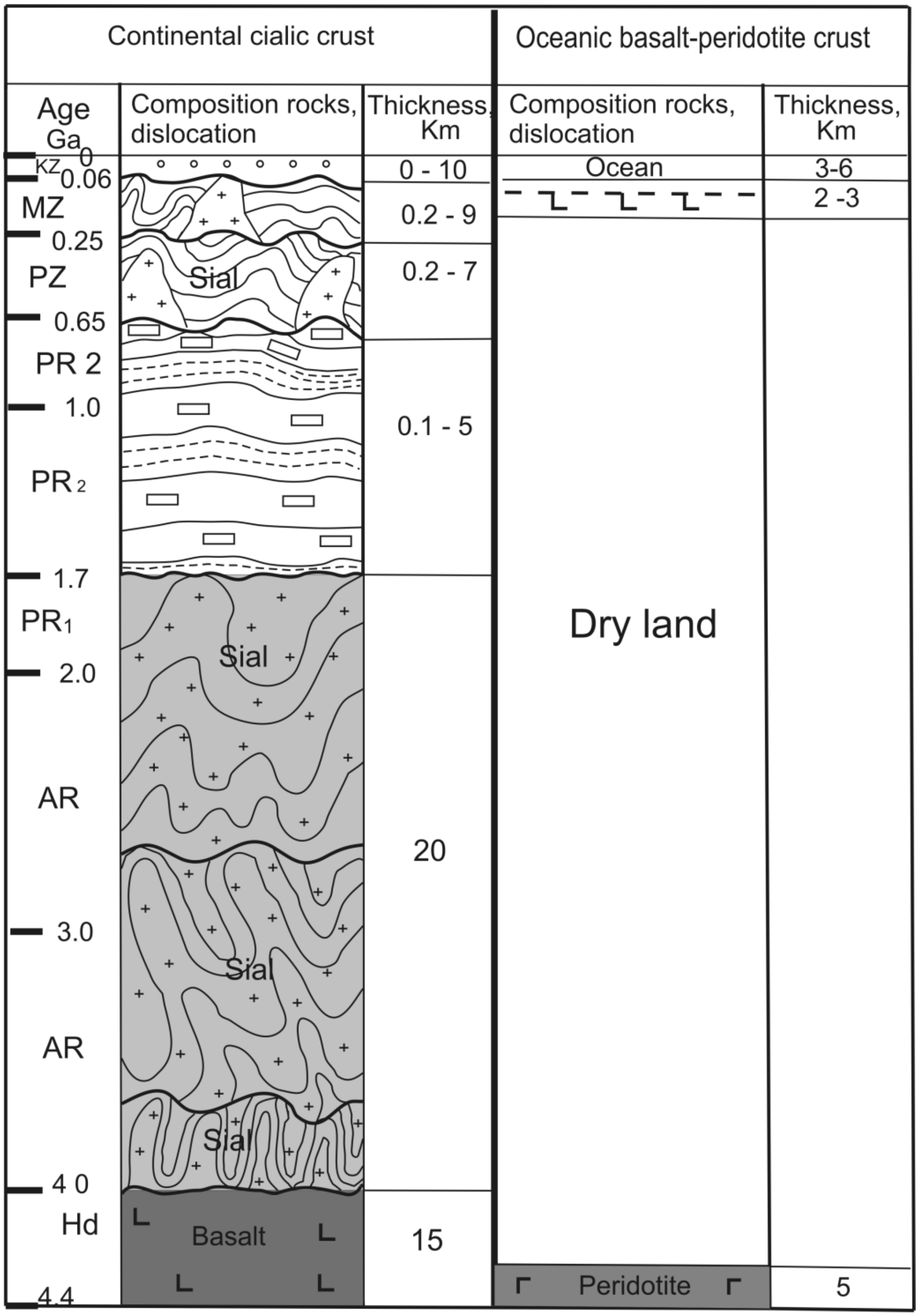

Figure 6
The main stages in the evolution of the Earth's crust different types (Stille, 1964; Hain, 1964; Demenitskaya, 1975; Gavrilov, 2005).

The subsequent tektonic-magmatic and geosyncline processes, in the Proterozoic and the Phanerozoic time, were shown on the lowered parts of the ancient base and at the edges of large horsts (ancient platforms) with building on the consolidated base top

sedimentary layer of continents. This thick layer is presented by the series of small horizontal and folded layers which made up together with complex of ancient rocks the face of the modern continents.

Square geosyncline basins decreased over time from Proterozoic to Cenozoic, suggesting a decrease in the activity of the Earth's liquid core (Zhirnov, 2014c). By the end of the Cenozoic time continents almost completely lifted and became dry land. (Zhirnov, 2014b). But their edge parties were flooded by young oceans and seas, including within the northern polar region. Here, almost all the plain of the Arctic territory was flooded with sea water and formed a huge shallow shelf with depths of 50-150m, at least - up to 1-2 km (Figure 5).

The tectonic structure of the area is briefly reviewed previously (Zhirnov, 2014a, 2014b).

The principal feature of all continents – presence in their bottom the ancient consolidated base created in the Hadean – the Archean. Thus, modern continents it is peculiar thick "scars" on a planet body which arose on places of originally huge and deep pits (figures 3 and 4). They developed in these pits during the entire geological history of the Earth and turned into a powerful consolidated body, it is difficult for new permeable ascending endogenous fluids. Due to the contraction of the globe due to the large loss of material from the outer core of the Earth (for 4 billion years), in the Mesozoic and the Cenozoic began to fall vigorously territory with primary peridotite crust located outside the continent. Thus began the geological development of the initially peridotite crust but in a fundamentally different algorithm. These areas were unevenly lowered to great depths and are covered with a thick horizontal layer of basalt, extrusive through a huge number of vertical fractures. Formed in this way the giant depression - grabens were also filled of the sea water sequentially coming from the depths - originated the modern world's oceans. Very different modes of formation of the continental and "ocean" crust are shown in Figure 6.

4. DISCUSSION

The Earth's continents are the main structures of the planet and the specific markers of the Earth's geological development. Real geological structures of the continents' sialic crust still had been determined by the classics of World's geology. Geological structure of the oceanic simatic crust and the dynamics of its development are established in the second half of twentieth century.

Consequently, the plate tectonics hypothesis widespread in modern geological science, proposed by American geophysicists 50 years ago (based on the alleged geodynamic processes in the ocean - femic Earth's crust) is completely contrary to the real geological structure of different types of crust and their historical geodynamics. Such hypothesis appeared mainly on the basis of assumptions convection of material in the solid mantle, like convection in liquids and gases (which in solid body physically impossible), as well as data on the paleomagnetism of rocks. Physical method of paleomagnetism is not developed in scientific essence, is not confirmed by reliable experiments and contains major methodological errors; does not allowing its use in geological practice (Kosygin, 1988; Shatrov, 2006). The results of his about moving geographical continents are in sharp contrast with the data of geological sciences about fixed position in space and time of a single three-beam megacontinent Earth and can not be taken into account in geological research of the earth crust (Shatrov, 2006; Volkov, 2013).

Fundamental differences between continental and oceanic crust and dynamics of their development are presented and discussed in the research of the last decade (Shlezinger, 2003; Kuprin, 2010; Bluman, 2011; Zhirnov, 2008, 2011a, 2011b, 2011c, 2014a). How exactly said Y.M. Mikhalev:"all this incoherent jumble of confused ideas lost the original meaning and rapidly going to crash" (Mikhalev, 2005, p. 87).

5. CONCLUSION

The continents of Earth having the powerful, geochemical specific crust formed during all geological history of the Earth. They are huge tectonic and geochemical anomalies – peculiar outgrowths of basalt and sial which appeared and grew in huge deep pits on the surface of the planet's peridotite mantle. These deep holes appeared on the planet's surface at the end of astronomical stage of its development as a result of the explosive disintegration Proto-Earth (Zhirnov, 2014d).

SUMMARY OF RESEARTH

1. The continents of Earth having the powerful, geochemical specific crust formed during all geological history of the Earth. They are huge tectonic and geochemical anomalies of the Earth.
2. The continents of Earth are peculiar outgrowths of basalt and sial which appeared and grew in huge deep pits on the surface of the planet's peridotite mantle.
3. The thickness of the earth's crust has consistently increased due to sedimentation and magmatism in the descending and ascending tectonic movements.
4. These deep pits appeared on the planet's surface at the end of astronomical stage of its development as a result of the explosive disintegration Proto-Earth.

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